

We Claim:-

1. A seal between a first member and a second member, the first and second members being relatively moveable, the second member being spaced from the first member, a third
5 member being positioned between the second member and the first member, the third member being secured to the second member or the first member, the third member having at least one corrugation in a direction between the first member and the second member and at least one corrugation
10 in a direction transverse to the direction between the first member and the second member, a lining being secured to the third member, the lining being spaced from the first member or the second member to form a seal.
2. A seal as claimed in claim 1 wherein there are a
15 plurality of corrugations spaced apart in the direction between the first member and the second member and a plurality of corrugations spaced apart in the direction transverse to the direction between the first member and the second member.
- 20 3. A seal as claimed in claim 2 wherein the first member is a rotor and the second member is a stator.
4. A seal as claimed in claim 3 wherein the third member is an annular member arranged axially between the rotor and the stator, the annular member being secured to the second
25 member, the annular member having a plurality of circumferentially spaced radially extending corrugations and a plurality of axially spaced circumferentially extending corrugations, the lining being arranged axially between the rotor and the annular member, the lining being
30 secured to the annular member, the lining being spaced axially from the rotor to form a seal.
5. A seal as claimed in claim 3 wherein the first member is a shaft and the second member is a stator, the third member is an annular member secured to and arranged within
35 the stator, the annular member having a plurality of circumferentially spaced axially extending corrugations and

a plurality of radially spaced circumferentially extending corrugations, the lining being arranged radially between the shaft and annular member, the lining being secured to the annular member, the lining being spaced radially from the shaft to form a seal.

6. A seal as claimed in claim 3 wherein the first member is a rotor carrying a plurality of circumferentially spaced radially extending rotor blades, the second member is a casing surrounding the rotor and rotor blades, the third member is an annular member being secured to and arranged within the casing, the annular member having a plurality of circumferentially spaced axially extending corrugations and a plurality of radially spaced circumferentially extending corrugations, the lining being arranged radially between the tips of the rotor blades and the annular member, the lining being secured to the annular member, the lining being spaced radially from the tips of the rotor blades to form a seal.

7. A seal as claimed in claim 2 wherein the third member is S-shaped in radial cross-section.

8. A seal as claimed in claim 2 wherein the third member is Z-shaped in radial cross-section.

9. A seal as claimed in claim 1 wherein the third member is a resilient member.

10. A seal as claimed in claim 1 wherein the third member is a thin structure.

11. A seal as claimed in claim 1 wherein the third member comprises a metal sheet.

12. A seal as claimed in claim 1 wherein the third member comprises steel, titanium, a titanium alloy or a nickel alloy.

13. A seal as claimed in claim 1 wherein the lining comprises felt metal, metal foam or a porous sintered metal.

14. A seal as claimed in claim 1 wherein there are means to measure a clearance between the lining and the first

member or the second member to produce a clearance signal indicative of the size of the clearance, there are processor means to determine if the clearance signal is within a predetermined range of clearances and there are
5 means to adjust the clearance between the lining and the first member or second member if the processor means determines that the clearance signal is outside the predetermined range of clearances.

15. A seal as claimed in claim 14 wherein the means to
10 measure the clearance comprises at least one capacitance sensor.

16. A seal as claimed in claim 14 wherein the means to measure the clearance is arranged within the lining.

17. A seal as claimed in claim 14 when dependent upon
15 claim 6 wherein the means to adjust the clearance between the blade tips and the lining comprises at least one piezoelectric actuator and at least one L-shaped member, the at least one L-shaped member acts on a radially inner portion of the annular member to move the portion of the
20 annular member towards or away from the blade tips.

18. A seal as claimed in claim 17 wherein the at least one piezoelectric actuator is outside the casing and the at least one L-shaped member extends through the casing.

19. A seal as claimed in claim 14 when dependent upon
25 claim 6 wherein the means to adjust the clearance between the blade tips and the lining comprises a plurality of shape memory alloy wires, each shape memory alloy wire extends over a circumferential portion of the radially inner portion of the annular member and heating means to
30 heat at least one of the shape memory alloy wires to move at least a portion of the radially inner portion of the annular member towards or away from the blade tips.

20. A seal as claimed in claim 19 wherein the heating means comprises a supply of electrical power and switch
35 means, the supply of electrical power and the switch means

being arranged to supply an electric current to the at least one shape memory alloy wire to heat the wire.

21. A seal as claimed in claim 14 when dependent upon claim 6 wherein the means to adjust the clearance between
5 the blade tips and the lining comprises a supply of fluid and valve means, the annular member being hollow, the valve means being arranged to allow the supply of fluid to the hollow annular member or to vent fluid from the hollow annular member to move the radially inner portion of the
10 annular member radially towards or away from the blade tips.

22. A seal as claimed in any of claims 17 to 21 wherein the means to measure the clearance comprises a plurality of circumferentially spaced sensors, the means to adjust the
15 clearance between the blade tips and the lining comprises a plurality of circumferentially spaced actuators and the processor is arranged to actuate different circumferential portions independently or semi-independently to maintain a uniform clearance or other desired condition.

20 23. A seal as claimed in claim 6 wherein the rotor is a fan rotor, a compressor rotor or a turbine rotor.

24. A seal as claimed in claim 6 wherein the rotor is a gas turbine engine rotor.

25 25. A seal as claimed in claim 1 wherein there are a plurality of third members between the first member and the second member.